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The Paradox of Demand-Supply and Price Dynamics during Covid-19 Pandemic: A Comparative Study on Pharmaceutical, Bakery and Table-Water Companies in Lagos, Nigeria

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Abstract: *The sudden emergence of Covid'19 pandemic amounts to monumental disruptions in global economic activities due to stringent measures such as lockdown of international and local transport systems and social distancing that were drafted to curtail the surging scourge. It might be a probable cause of the noticeable dramatic dynamics in demand, supply and prices of goods and services. The study examined the paradox of demand-supply and price dynamics during covid'19 pandemic: a comparative study of pharmaceutical, bakery and table water companies in Lagos, Nigeria. The study employed structured questionnaires to generate primary data which were analyzed using chi-square method corroborated by oral interview. A total number of 90 set of questionnaire were distributed to 30 selected companies. Results revealed that there were no price variation in pharmaceutical products, bakery products and table water companies' products during the first wave. This is because the restriction of movement did not affect essential commodities and international borders were open for pharmaceutical goods as well as other essential products. However, interview report showed that there were moderate increase in demand for bakery and table water companies products with no corresponding rise in prices. It was made possible by active policy directives of the national and state governments that were implemented by monitoring groups. The paper suggests that during global exigencies, the net of essential commodities should be widened and their prices controlled as well as avoid artificial hoarding to meet up with the upsurge in demand which is a necessary outcome during epidemic.*
Keywords: *covid 19; demand; price; supply; Lagos Nigeria*

I. Introduction

The advent of Covid-19 pandemic resulted to monumental shock to global economic activities. Its effects virtually truncated economic activities in the world (Almut, et al, 2020). Due to the enforcement of lockdown orders, companies producing non-essential goods and services according to government categorization were compelled to shutdown productive activities. These disruptions in economic activities affected the interplay between demand, supply and price, raise uncertainties and interrupted international supply chains (Baldwin,2020; Hassler, et al, 2020; Cespedes, et al, 2020).

Every economy in the world is made up of agents who interface by exchanging ideas, technologies, monies, goods and services. These economic agents include producers, suppliers, customers, workers, bankers, promoters, brokers etc. The interplay among demand, supply and price mechanisms connects these agents to one another. The point of equilibrium between two or more parties is determined by demand and supply at the agreed price. This explains the triangular relationships connecting the three market forces. Under normal economic circumstances, markets are regulated by the invisible hands of demand and supply, may be, in conjunction with trade unions and the government. In a capitalist regime, market forces have greater leverage in price regulation while in a socialist' economy, the government

largely dictates the fixation of price and even production. Since, there are rarely complete capitalist or complete socialist economies in the world, the fusion of invisible hands of Adams Smith, Trade unions and Policy makers regulate the activities of the market.

However, the dynamics in the market economy changes during pandemic especially in global disasters such as the current Covid-19 pandemic. Hitherto economic permutations, expectations, projections/forecasts, contracts and subsisting relationships have been dramatically altered. Health reports showed that Covid-19 was caused by severe acute respiratory syndrome 2(SARS-COV2) which originated from wet animal market in Wuhan, China, early December, 2019 (Paolo & Andrea, 2020; Farayibi & Asongu, 2020).

The effect of Covid-19 pandemic is shocking to both experts and laymen based on the rate of its spread to the seven continents of the world. Almut et al.,(2020) states that, the disruptive tendency of corona-virus on global economy had compelled policy makers all over the world towards pursuing stabilization measures that will help to recuperate distressed economies. Economic disruptions are far reaching leading to alteration of the forces working on supply and demand, breakage of international supply chains, reduction of workforce, income risks, uncertainties, input-output propagation or health challenges resulting to sickness and death tolls (Baldwin, 2020; Hassler, et al, 2020; Guerreri, et al,2020; Eichenbaum, et al, 2020). Basic economic conditions are showing that prices of goods and services reflect shifts in demand and supply depending on prevailing factors. In such case(s), a reduction in the supply of goods and services necessitated by cost of production and may be, artificial hoarding will generate inflation while a decrease in demand connotes disinflation. In a disaggregated New Keynesian economy, these fundamental predictions are causes of inflationary supply and deflationary demand shocks.

Alex et al (2020) contend that demand is volatile right now. Obviously, demand and supply of goods and services are not usually static. They are dynamic phenomena that create price fluctuations in non-monopolistic markets. Demand, supply or price oscillates both at pandemic or normal market periods however, with higher frequencies during crises. It is possible to predict changes in demand, supply and price in non-crisis time but, extremely difficult to estimate with accuracy because of the uneven nature and changing predicaments. In economics, a monopolistic firm has the rights (preference) of fixing price and deciding the amount of goods to produce which may lead to abnormal profits during pandemic if government categorises its products as essential commodities.

Covid-19 pandemic has turned the economy of the world upside down dragging fragile economies into recession and prompting the need for prioritization of programmes according to country's specifics. The pandemic has also caused unprecedented pressures on both the public and private economy (Alex, et al, 2020). Demand, supply and price of goods and services are at the epicentre of these global economic dynamics. The popular construct of 'invisible hands' of trade that determine the price regime may have been displaced by Covid-19 crisis. Market forces are temporarily on hold, allowing for panic purchases influenced by the unclear picture of the ravaging health and economic tragedies. Alex et al., (2020) also posits that the corona- virus disease and global economic crises may have raised the continuum of demand, supply and price reactions in the world.

Firms-level evidences on Covid-19 impact have caused multiple shifts in supply and demand within the crisis period (Almut, 2020). Evidence also showed that services rendering companies were hit harder than retail businesses. The closure of services industry such as the hospitality sector, entertainment, travelling arrangements, and reservations (airports services) has affected supply of labour and truncated businesses. The manufacturing, machinery repair

and leather industry were adversely affected. However, the food production industry, rubber and plastic goods, and pharmaceutical companies greatly benefited according to ifo-Business Climate Survey (Almut, 2020). The dynamism of demand arose due to economic uncertainties, input-output structure, less substitutable goods, goods associated with health risks (Baqaee & Farhi, 2020; Guerrieri, et al, 2020; Eichenbaum, et al,2020; Almut, et al, 2020).

The imposition of lockdown by the Federal and State governments as a measure to mitigate the spread of the Corona virus disease is assumed as one of the causes of disruptions in demand and supply in the markets. The shutdown of production companies and services rendering centres designated as non-essential may have heightened panic sales and purchases, shifts in demands and supply influenced prices of commodities globally. A vivid reaction to price hike of goods and services during the Covid-19 distress was demonstrated by actions of youths of Asaba and Warri (Capital territory and Commercial city in Delta State, Nigeria). Aggrieved youths were displeased with the skyrocketed price of a bowl of garri (Nigerians staple foodstuff) from three hundred naira to one thousand naira in just few days into the pandemic, vented their anger by destroying seller's bags of garri at both Warri and Asaba markets. These were shocking scenarios until government authority declared an executive fiat on price regulation on goods. Due to crisis some goods and services such as, pharmaceutical, bakery and table water companies' products were categorised as essential goods in Nigeria.

It is on this note that this paper is comparatively assessing the impact of Covid-19 pandemic on sales of pharmaceutical, bakery and table water companies in Lagos, being the epicentre of confirmed cases. The findings will help policy makers in making relevant decisions on categorization of essential goods and services during pandemic and marshalling several economic stimuli to avert recession in future crisis. The study is theoretically anchored on aggregate supply and aggregate demand (AS-AD Model) model as demonstrated in Farayibi and Asongu (2020).

The paper is organized into five sections. Sequel to the introduction is the review of literature in section two while section three will address materials and methods adopted in the research. Section four will consider analysis of data and discussions on findings and section five will harp on conclusion and recommendations.

II. Review of Literature

Warwick and Roshen (2020) stated that economic costs of infectious diseases were usually underestimated when assessments were done through conventional methods. The author stressed that the implications of Covid-19 would be better imagined by reflecting on previous experiences from disease outbreaks such as HIV/AIDS, SARS and pandemic influenza. These outbreaks resulted to sicknesses, deaths, untold hardships, emergency decisions and re-prioritization of plans/budgets. Hacker (2004) explained the effects of HIV/AIDS virus on households, businesses and governments. The crisis has altered labour supply decisions, households' incomes, raised business costs and increased public expenditure on health care. Consequences of the virus were long-term until antiretroviral therapies were manufactured to extend life expectancy of patients. Studies on macro-economic impacts of HIV/AIDS abound (Arndt & Lewis, 2001, Bell, et al, 2004, Cuddington, et al, 1994).

Lee and Mckibbin (2003) study on the effects of SARS epidemic found out that there was large reduction in consumption of goods and services, increase in operation costs and risks of investments. The degree of shocks to an economy depended on the country's vulnerability to the disease. However, the shocks were not limited to the affected countries. Boom, et al (2005) study also demonstrated that the economic impact of the mutated avian influenza strain using the Oxford Economic Forecasting Model. It revealed demand contraction in two-quarters in Asia resulting to 2.6 percent Asian GDP or US $3.2 billion dollars, deeper shock to

consumption and loss of revenues from exports amounted to 6.5 percent of GDP (US $282.7 billion). The study also showed decreased global GDP of about 0.6 percent while global trade of goods and services contracted by 14 percent (US $2.5 trillion).

Daniel, et al (2020) developed a weekly economic index (WEI) to evaluate the developments accompanying the advent of the coronavirus in the United States. The paper revealed a strong and sudden decrease in economic activities. Economic activities had fallen to -8.89% scaled to 4 quarter growth in GDP. Abel (2020) predicted that Covid-19 would slowdown economic activities. International Monetary Fund (2020a) forecast a global economic contraction by about 3 % in 2020. A revised forecast by IMF (2020b) shot up to 4.9 % contraction. IMF cited the following factors were responsible for the economic downturn; persisted social distancing, prolonged lockdowns, decline in production and greater uncertainties. This showed that labour markets, production and supply chain, financial markets and world were affected. Abel (2020) opined that government intervention may result to mental health distress, increased economic inequality and dislocations of socio-demography.

Farayibi and Asongu (2020) had a study on the economic consequences of the Covid-19 pandemic in Nigeria. Aggregate supply and aggregate demand AS-AD model was the theoretical anchor for the study. The authors asserted that global economic fluctuations were generated by the Covid-19 pandemic. However, the pandemic had insignificant negative effects on macro-economic variables, inflation, employment, exchange, GDP growth in Nigeria. To empirically assert causality between these correlations, time was of essence. The study recommended that government should evolve an inclusive and sustainable economic development plan. The price of oil during this Covid-19 pandemic dropped drastically to $35 per barrel which compelled Nigerian government to revise her budget 2020 downward. Exchange rate of US dollar increased at the expense of the Naira. These economic indices were direct or indirect consequences of Covid-19 pandemic.

Comparatively, Covid-19 has a disproportionate impact on the elderly health status. The lockdown measures have disrupted supply chains, aggregate demand and consumption patterns globally than its predecessors. Economic shocks and financial market turbulences have been amplified resulting to borrowings and higher debt levels for households, firms and countries (Abel, 2020; Boissay and Rungcharoenkitkul, 2020). Carlsson Szlezak et al (2020a, 2020b) listed three channels of transmitting the negative economic impact of Covid-19, namely, direct, indirect and supply-side disruptions. The authors emphasized that, direct impact relate to reduction in consumption of goods and services, indirect impact affects the financial market and the real economy. The lockdown of production processes has negatively affected supply chains, labour demand and employment.

Baldwin (2020) contended that Covid-19 has adversely affected the flow of income in the economy. Households have reduced consumption and savings levels due to no payment by employers. The reduction in demand for imports is causing continuous reduction of income to the rest of the world. Demand and supply shocks have caused displacements in domestic and international supply chains. Gourinchas (2020) described the relationships among economic agents in the world (employees, firms, suppliers, consumers, financial intermediaries). He posited that everyone is an employee, consumer, lender etc to another. Any disconnection of supply chain (and may be, circular flow) will result to a ‘cascading effect’ that will rob on other agents.

No pandemic is permanent. The public and private institutions should understand the processes that lead to recoveries from economic downturns. Recovery processes were itemized by Carlsson-Szlezak et al (2020a) as V-shaped, U-shaped and L-shaped paths. With V-shaped, there are high hopes of recovery and bounce-back to boom. Under a U-shaped shock geometry, recovery will drag for a period of time. L-shaped shock is the worst scenario whose recovery is grim and very slow. Baker et al (2020a) study found out that, there was a

sharp increase in households spending in retail and food during the initial period of covid-19 followed by a decline in overall spending. In Binder (2020) study on the perception of households on covid-19 pandemic, consumer was pessimistic because of higher inflationary expectations which necessitated food purchases - the cause for panic buying of food stuffs. Cespedes et al (2020) predicted loss of production due to restrictions on non-essential businesses. A vicious cycle of plenty is thus created resulting to unemployment and asset price deflation doom loop overstretched by covid-19 shock.

Developing economic face higher risk due to lower health system capacity, less possibility to washing hands with soap and more so, economies are dependent on advanced economies demand and total lockdown effects (less access to internet to facilitate work from home). These factors have caused changes in the choices of households, firms and government (Paulo and Andrea, 2020). The study predicted another imminent economic recession. Calculation from financial investments showed large declines in the stock exchange market, large declines in the restaurant industry, demand for durable products (cars) was deferred for precautionary motive. However, impact on the supply chain of smartphone shipment in China was mild and expected to recover quickly. The author's listed sectors impacted with severe consequences were tourism and hospitality, aviation/airlines, oil and gas, automotive and consumer electronics and semi-conductors.

The study of Paolo and Andrea (2020) demonstrated the race between supply and demand with three simple models

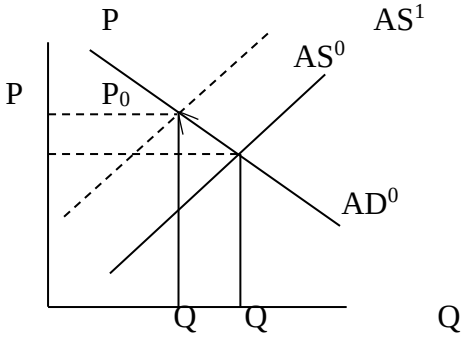

Figure1. *Shift in Supply*

Covid-19 pandemic demonstrated a supply shock effect on the global economy. Quarantine and social distancing measures across the world decrease labour supply. That is why aggregate supply (AS) moved from AS^o to AS^1.

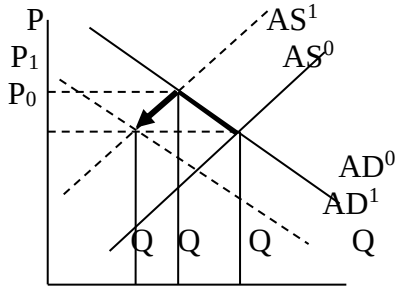

Figure 2. *Shift in Demand and Supply*

The changes in demand, supply and price were caused by the uncertainties about the progress of disease, uncertainties about economic policies, loss of income in affected industries (hospitality manufacturing etc), increased households' precautionary savings and firms wary of investments due to illiquidity.

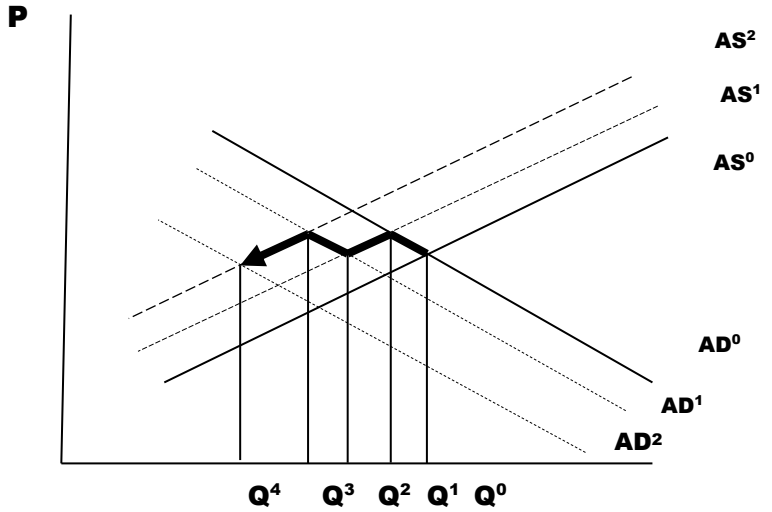

Figure 3. *Feedback Loop into Demand*

The movements of demand and supply and consequent changes in prices due to decrease in demand, lack of liquidity may compelled firms whose capital base is poor to file for bankruptcies and liquidation. Paolo and Andrea (2020) posit that Covid-19 may cause destruction of economic surplus. It is the wall between demand and supply with negative impact on the real economy. The pandemic has created a continuum of reactions and effects on the economy. Any contraction in supply leads to a contraction in demand which in turns causes a contraction in supply until it destroys the surplus in the economy.

The study (Paolo and Andrea, 2020) recommended measures to flatten the imminent recession curve such as increase in health expenditure, random testing, cash disbursement to households and firms, print money (not economical) and global collaboration against the shock. However, the option of printing cash should be last resort, where other measures could not help matters being a channel to inflation and lack of global control mechanism in every country. The printing of money may also deprive some countries from implementing productive policies and harnessing their natural endowments into viable economic units. In this pandemic, the Dutch Disease Syndrome is crushing some countries that are endowed with natural resources without concrete diversification and liberal policies (especially oil producing nations like Nigeria).

III. Research Methods

3.1 Materials

The study employs structured questionnaires to generate primary data from 90 respondents chosen from 30 selected companies. Companies used were selected on the basis of simple random sampling technique. The frequency table represents the questionnaire distribution pattern;

Table 1. Frequency Distribution of Questionnaire

Companies	Frequency	Percentage
Pharmaceutical companies	30	33.333
Bakery Companies	30	33.333
Table Water Companies	30	33.333
Total	90	100%

3.2 Method

The primary data were analysed using non-parametric statistical analysis known as Chi-square method. Hypotheses were tested at 5% level of significance.

3.3 Model Specification

The Chi-square model is as follows;

$$X^2 = (O_1 - E_1)/E_1$$

Where;. X^2 is Chi-square

O_1 is observed

E_1 is expected

3.4 Hypothesis

Three hypotheses were formulated and tested in the study

Ho1 :Covid'19 pandemic did not have positive and significant relationship with, demand supply and price of pharmaceutical products during the first wave.

Ho2 ; Covid'19 pandemic did not have positive and significant relationship with demand, supply and price of bakery products during the first wave

Ho3 : Covid'19 pandemic did not have positive and significant relationship with demand, supply and price of Table Water Company's products during the first wave.

IV. Discussion

4.1 Results

Table 1. Combined Response Pattern for Questions 3 and 4

QUESTIONS	SA	A	DA	SD	TOTAL
3	10	25	25	30	90
4	20	30	30	20	90
TOTAL	30	45	55	50	180

Table 2.

Combined options	Resp. 3	Resp. 4	Total
Agree[SA/A]	35	40	75
Disagree[D/SD]	55	50	105
Total	90	90	180

75*90=37.5

Expected frequency for [SA-A]=75*90=37.5
180

Expected frequency for [SD/D]= 105*90=52.5
180

X^2= [35-37.5]^2+[40-375]^2+[52-52.5]^2+[50-52.5]^2
37.5 37.5 52.5 52.5

Calculated Chi square [X^2C] = 0.57
Tabulated value [X^2T] =3.84
Level of significance =5%
Degree of freedom =1

Table 3. Combined Responses Pattern on Question 7 and 8

Question	SA	A	D	SD	Total				
7	10	25	25	30	90				
8	20	20	30	20	90				
Total	30	45	55	50	180				

Table 4.

Combined options	Resp. 7	Resp. 8	Total
Agree[SA/A]	40	46	86
Disagree[SD/D]	50	44	94
Total	90	90	180

Expected frequency for [SA-A] = 86*90=43.0
180
Expected frequency for [SD/D] = 91*90=47.0
180
X^2=[40-43]^2 + [46-43]^2+[50-47]+[44-47]^2
43.0 43.0 47.0 47.0
X^2=0.80

Calculate chi-square [X^2C] = 0.80
Tabulated value [X^2T] =3.84
Level to significance=5%
Degree of freedom=1

Table 5. Combined Response Pattern on Question 11 and 12

Questions	SA	A	D	SD	Total
11	20	22	23	25	90
12	23	24	20	23	90
Total	43	46	43	48	108

Table 6.

Combined options	Resp. 11	Resp. 12	Total
Agree	42	47	89
Disagree	48	43	91
total	90	90	180

Source: chi square analyses tables computed by authors, 2022

Expected frequency for [SA-A] $\frac{89*90}{180}=44.5$

Expected frequency for [SD/D] $\frac{91*90}{180}=45.5$

$$X^2=\frac{[42-44.5]^2}{44.5}+\frac{[47-44.5]^2}{44.5}+\frac{[48-45.5]^2}{45.5}+\frac{[43-44.5]^2}{45.5}$$

$$X^2=0.5524$$

Calculate chi-square [X^2C]=0.55
Tabulated value [X^2T]=3.84
Level of significance=5%
Degree of freedom=1

4.2 Discussion

Decision rule: the null hypothesis will be accepted when the Calculated value (X2C) is less than the Tabulated value (X2T) but the null hypothesis will be rejected if the Calculated value is greater than the Tabulated value.

Hypothesis one: covid'19 pandemic did not have a positive and significant relationship with demand, supply and price of pharmaceutical products during the first wave.

Results from Chi-square analysis revealed that the Calculated value (X2C) is less than the Tabulated value (X2T); 0.57 <3. 85. which means that the null hypothesis must be accepted. It means there was no positive and significant relationship between covid'19 pandemic and demand, supply and price of pharmaceutical products during the first wave of the pandemic. This is because pharmaceutical products were classified by government as essential commodities and were not bound by the imposed restrictions during the first wave. There were no increase in price of pharmaceutical products because the task force did an effective monitoring job during the pandemic. It was normal sales pattern based on health challenges while suspected patients manifested Covid'19 symptoms were treated at designated health care centres. This result is line with Almut (2020), that pharmaceutical companies and food industry benefited during covid'19 pandemic. Ordinarily, without government intervention, demand arises due to economic uncertainties, less substitutablegoods and goods associated with health during epidemics (Baqaee & Fathi, 2020; Guerriero et al., 2020).

Hypothesis two: Covid'19 pandemic had no influence on demand supply and price of bakery products during the first wave.

It was observed from the Chi-square analysis that the Calculated value (X2C) is less than (X2T); 0.80 < 3.58. This statistic means the null hypothesis is correct and accepted. There was no positive and significant relationship between covid'19 pandemic and price of bakeryl products during the first wave. It should recalled that bakery products were categorised as essential products by government during the covid'19 pandemic and were exempted from restrictions and sanctions. However, interview report showed that there were increase in demand and supply without proportionate rise in prices. This infers that the Tasks

Force assigned to monitor anomalies, price inflation did a great job. Lee and McKibbin (2003) showed that during SARs epidemic there was large reduction in consumption of goods and services. There was demand contraction in two quarters in Asia during Mutated Avian Influenza Strain (Boom et al.,2005). These instances indicate government interventions.

Hypothesis three: covid'19 pandemic did not influence demand supply and price of table water during the first wave.

Analysis of Chi-square demonstrated that the Calculated value (X2C) is less than the Tabulated value (X2T), 0.55<3.58. It means that the null hypothesis is accepted and the affirmative hypothesis is rejected. Findings connote that there was no positive and significant relationship between covid'19 pandemic and price of table water during the first wave. This position is due to fact that covid'19 restrictions did not affect prices of table water Companies products as essential commodities during the pandemic and the government monitoring group helped in stabilising the hitherto prevailing price during the first wave. Interview report showed an upward demand and supply of table water with no corresponding increase in prices. That means market forces were not allowed to interplay to fix any new price because government policy regulated the prices of essential goods. In Baldwin (2020), Covid'19 pandemic had a negative effect on the flow of income and reduction in household's consumption and saving levels because employers were unable to pay workers.

V. Conclusion

The study examined the paradox of demand-supply and price dynamics during covid'19 pandemic: a comparative study of pharmaceutical Bakery and Table Water Companies in Lagos, Nigeria. Paradoxical, results revealed that Covid'19 outbreak did not show positive and significant relationship with demand, supply and prices of pharmaceutical products during the first wave. It was discovered that the pandemic did not generate any rise in prices of Bakery and Table Water Companies products. However, there were mild increase in demand for bakery and table water without proportionate rise in price. Reasons adduced are; one, they were classified as essential products, two, these products were not under any restriction, three, their companies were not barred from production during the period and four, government set up active monitoring groups to monitor and apprehend any violator of prevailing price regime.

Based on the findings, the following measures are recommended;

1. The net of essential products be enlarged to accommodate more staple food items in time of crisis
2. Goverment should set measures such as Special Monitoring Task force to arrest artificial hoarders of food items and other essential commodities especially in emergency.
3. Companies producing essential commodities should be assisted with finance to boost production during and after epidemic.
4. Government should subsidise the price of staple food and essential products so that the masses can afford their purchase during pandemic.

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Appendix: Research questions (SA, A, D SD)

A) Pharmaceutical Companies

1. Were you aware that pharmaceutical products were classified as essential products during the covid'19 period?
2. Did covid'19 outbreak affected your sales during the first wave?
3. Did covid'19 pandemic affected demand and supply of products during the first wave?
4. Did your company increase the price of products and services?

B) Bakery companies

5. Did you know that bakery products were categorised as essential commodities during the covid'19 pandemic?
6. Did the pandemic affected your sales
7. Did the pandemic affected demand and supply of products during the first wave?
8. Did the crisis cause increase in prices of products during the first wave?

C) Table Water Companies

9. Were you aware that table water was classified as essential products during the covid'19 outbreak?
10. Did the crisis affected your sales?
11. Did the pandemic affected demand and supply of products?
12. Did company increase prices of products due to covid'19 outbreak?

NB; SA is strongly agree, A is agree ; D is disagree ; SD is strongly disagree